

# Psychological Bulletin

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HOWARD C. WARREN, PRINCETON UNIVERSITY (*Review*)

JOHN B. WATSON, JOHNS HOPKINS UNIVERSITY (*J. of Exp. Psych.*)

JAMES R. ANGELL, UNIVERSITY OF CHICAGO (*Monographs*) AND

MADISON BENTLEY, UNIVERSITY OF ILLINOIS (*Index*)

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## CONTENTS

### General Reviews and Summaries:

*Historical Contributions:* W. RILEY, 1. *General Standpoints: Mind and Body:* W. T. MARVIN, 3. *Consciousness and the Unconscious:* H. W. CHASE, 7. *Introspection and General Methods:* C. H. TOLL, 11. *Bibliographical:* H. C. WARREN, 14. *Apparatus:* C. E. SEASHORE, 15. *Text-books and General Treatises:* H. S. LANGFELD, 17.

### Special Review:

*Patrick's Relaxation:* H. N. GARDINER, 22.

### Discussions:

*Effects of Smoking on Adding:* C. S. BERRY, 25. *A Method of Calculating the Pearson Correlation Coefficient Without the Use of Deviations:* L. L. THURSTONE, 28.

### Notes and News, 32.

PUBLISHED MONTHLY BY THE

PSYCHOLOGICAL REVIEW COMPANY

NORTH QUEEN ST., LANCASTER, PA.,

AND PRINCETON, N. J.

AGENTS: G. E. STECHERT & CO., LONDON (2 Star Yard, Carey St., W. C.);  
LEIPZIG (Koenigsstr., 37); PARIS (16, rue de Condé)

Entered as second-class matter January 21, 1904, at the post-office at Lancaster, Pa., under  
Act of Congress of March 3, 1879

# Psychological Review Publications

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THE  
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## GENERAL REVIEWS AND SUMMARIES

## HISTORICAL CONTRIBUTIONS

BY WOODBRIDGE RILEY

*Vassar College*

The French necrology includes François Pillon, founder of *L'Année Philosophique*, Jean Henri Fabre (14), "the Homer of the insects," and Louis Couturat (8), one of the founders of the *Revue de Métaphysique et de Morale*, editor of the manuscripts of Leibnitz found in Hanover, and projector of an International Encyclopedia of the Philosophical Sciences. As to the Germans we can notice only August Weismann (4) who is described as holding tenaciously to a mechanical conception of the universe, and Theodor Lipps (1) whose work in æsthetics, ethics and logic is made akin to those of Brentano, Meinong, and Cornelius. From Great Britain comes an account of the late A. C. Fraser (10), the editor of Berkeley's work, as a thinker who was independent of German philosophy, free of a technical dialect, and therefore influential upon public opinion.

In France, says Lalande (9), philosophical work and production ceased at the beginning of the war, but has since revived in studies of the origins and grounds of the war. In these the doctrine of natural rights has come to the fore and that of individual liberty is emphasized by Boutroux, Bergson, and Blondel.

Wundt's folk-psychology is held to be the crowning achievement of his thought (5), yet his treatment is criticized as unhistorical and his theory of the folk-soul, as an over-individual actuality, is called a mere fallacious conceptualizing.

Burrell's account (2) of the plot of Plato's Republic is dry, but Stocks's tracing of Plato's psychology to Pythagoras is very ingenious (13).

American contributions for the year are varied and voluminous. Ruckmich (12) contends that while native psychology lacks historical background, it has taken its place in the world as an undisputed natural science. This is shown by a large number of articles under the heading of general apparatus and technique. Most significant is a series of papers in honor of Josiah Royce on his sixtieth birthday. His general reputation is considered by Howison (7) as not due to his Hegelianism but to his voluntarism, and his pedagogical influence (6) to the doctrine of each individual being a unique embodiment of the absolute will. Royce's success as a teacher (3) is attributed to the fact that he possessed the maximum historic consciousness with the minimum of slavery to the past. All this is borne out by what proved to be Professor Royce's last public words (11), an inimitable compound of wisdom and humor, never to be forgotten by those privileged to hear them.

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## GENERAL STANDPOINTS: MIND AND BODY

BY WALTER T. MARVIN

*Rutgers College*

Several problems belonging to the philosophy of life and mind are to be found among the prominent subjects of current discussion. Neal (14) revives an old-fashioned argument in favor of vitalism: first, that vitalism is opposed not to mechanism but to mechanism turned into a universal materialism; and second, that materialism and even dualism are rejected by the philosophical thought of modern times in favor of idealism. That is to say, the issue between mechanism and vitalism is to be settled in favor of vitalism by accepting an idealistic philosophy rather than by any possible results coming from experimental research. To appeal in the matter to the results of research is to appeal to the wrong court. Haldane (6) maintains that the notion, *life*, is fundamental. It can not be defined in terms of anything simpler. "Life is a whole which determines its parts. They exist only as parts of the whole." Moreover, this idea can be made use of in research. "The whole is there, however little we as yet comprehend it. We can safely assume its presence and proceed to discover its living details piece by piece, in so doing adding to our knowledge of the whole." Brown (3) reformulates the philosophical principle of structural levels in the scientist's world, showing that what so much perplexes us in such problems as those of life and mind is reducible to different orders or levels of organization. Each level from an electron to mind and society is an integration of the entities of the lower level and exhibits new properties as the result of its more complex organization.

To the question: Does structure determine function, or does function determine structure, or does each determine the other? Abbot (1) replies: Teleologically, function determines structure; but mechanically, structure determines function. For example, "the physical nature of light and color as a mode of energy has determined, as final cause, the general nature of the organ which shall be sensitive to or stimulated into activity by it. Equally obviously the actual structure of the organ sensitive to light in any given biological unit, whether the red spot of the starfish or the eye of man with its nervous connections, will determine, as an efficient cause, the extent and completeness of the reaction made by



that unit." In a second article Abbot (2) discusses the biological point of view in psychology. From this point of view man is a biological unit reacting to an environment. In him the psychical event is always some reaction; and his mind is "the organized whole of the psychic reactions, or the capacity to react in psychical ways, or the content of the psychical reactions." Man's mind is related to man's body as "function or activity is related to structure." Finally, to understand psychic reactions we need to know two things, the structure that subserves the function and the function that is subserved.

Purpose and teleology also have been subjects of current discussion in the philosophy of mind. Warren (15, 16) analyzes the nature of purpose as observable in conscious volition and with the results of this analysis studies first, purpose in "objective" or biological behavior and second, "the rôle of purpose in the general scheme of nature." The distinctive feature of purposive experience is "the inversion of the usual time order of certain events. Representation precedes presentation, the general precedes the particular." Five factors are involved, forethought, assent, potency-feeling, notion of self and sense of fitness. The purposive behavior of organisms is characterized by two of these factors, for anticipation is genuinely present and so is fitness. As to purpose in nature or in the origin of the cosmos, search finds no clear evidence of anticipation or preparation. However, in the general scheme of *cosmic history* "we find indications of a *trend*, but not of *purpose*." Henderson (7, 8) reaches the conclusion "that in one of its most important aspects the teleological appearance of nature depends upon an unquestionable relationship between the original characteristics of the universe which, because it is merely a relationship and in no sense a mechanical connection, because it is unmodified by the evolutionary process and changeless in time, is to be described as teleological." The aspect particularly in question is the remarkable *collection* of properties and activities found in the three elements, hydrogen, carbon and oxygen and in their compounds water and carbonic acid.

The nature of the mental also has been a subject of current discussion. The standpoint of MacDougall (12) is expressed as follows: "Personal experience is intelligible only when conceived in terms of a significant process in which, through reaction upon a conditioning and modifiable world, certain practical and theoretical ideals are realized. The primary aspect of all experience is this

rearrangement of its materials in the service of an ideal order. The specific content of any such ideal must be stated in terms of the subject of experience and its demands, whether the organization be practical or sentimental or logical. The forms of organization comprised by the cycle of experience are thus never to be referred to objective determinants, such as the recurrences and juxtapositions which are to be found in their material elements. Every unity of experience reflects the synthesizing activity of the self which is universally originative. To refer it to the unities of the world of physical stimulations is unthinkable." Dunlap (5) distinguishes between *consciousness* and *content*. Consciousness is the awareness of something, that is, of content. Perception and thought "designate the two sorts, or forms of consciousness: *perceiving* and *thinking*, together, designate all that can be included under *being conscious*." Introspection is "observation through myoesthesia and observation through other somatic and visceral senses, as opposed to external observations through vision, touch, etc." The field of psychology is occupied by three studies, analytic, or objective psychology, the science of behavior and the study of the mind. This mind is not "an inner world of psychic reality distinct from the world of perceptible outer objects." What it is, Dunlap promises to make clear in a later article. Hollingworth (9) claims that the distinction between "the natural or physical order" and the "mental order" is a matter purely of statistics. Experiences differ by being, at the one extreme, indefinite and rare and, at the other extreme, definite and common. Now they are psychical in so far as they are the former and physical in so far as they are the latter. "The physical world consists of those experiences which are statistically common. The independence of these objects, their stubbornness, their resistance, their objectivity and naturalness, these all are not unique characteristics which suffice to split experience in two, they are merely various and interesting ways of stating the same statistical fact. The dependence, the subjectivity, the personal character of other experiences, the so-called mental order, are merely literary terms which express their statistical limitations and their consequent vagueness and complex conditions of appearance." Hence it is quite unnecessary to insist on giving up either end of the experience continuum, or to talk as though either differed from the other fundamentally or qualitatively, or again to adopt a mysterious and inexplicable dualism. Marvin (13) points out that during the past three centuries science has been

outgrowing the notions of *cause* and *substance* and has been replacing them by the notions of *function* (*mathematical*) and *structure*. He identifies behaviorism and the new realism as this same tendency manifesting itself in the field of psychology. Lowenthal (10) calls our attention to many parallelisms between the elements of Holt's doctrine of the nature of consciousness and the elements of Spinoza's monistic and rationalistic metaphysics.

Within general psychological theory several fundamental matters appear in current discussion. Watson (17) shows how the study of conditioned reflexes can be made to take the place of introspective study. Again, Watson (18), in analyzing the concept "mental disease," reduces the phenomena pointed out by the Freudian to twisted or disturbed habits. These habits in turn can be conceived much more simply by being looked upon as special forms of conditioned reflexes. McComas (11) claims that there is an obvious extravagance in the theory that "a motor expression accompanies *all* conscious processes." "No one will deny that there is a deep-seated tendency for the incoming impressions to go out into motor expressions; but there is nothing more than a *tendency*." If the motor theory were universally true "then the motor areas would be most important for consciousness. Injuries in them should do greater damage to consciousness than injuries elsewhere." But the reverse is true. If a chain of several neurons offers higher resistance than that of a few then may it not happen that impulses sometimes get stalled? Buddenbrock (4) shows the inadequacy of the tropism theory of Loeb. The conditions premised by this theory are not always present, and yet the tropisms take place. Sometimes when they are present the tropisms take place in a manner to contradict the theory. Finally, the theory is inadequate to explain even the turning around a vertical axis in symmetrical animals. Hence Buddenbrock retains his "old opinion that tropisms, like all other reflexes, were originally individual actions, which, in the course of time, have become mechanical and involuntary."

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## CONSCIOUSNESS AND THE UNCONSCIOUS

BY H. W. CHASE

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There can be no question that consciousness is rapidly losing its standing as a respectable member of the psychologist's vocabulary. Titchener, in the preface to his new text (13), says: "I have avoided the term 'consciousness.' Experimental psychology made a serious effort to give it a scientific meaning, but the attempt has failed, the word is too slippery, and so is better discarded." The elusiveness of the conception appears from a different point of view in the suggestions given as to the topic for discussion at the annual meeting of the American Philosophical Association (7). Two questions are proposed; is the division of experience into mental and physical to be retained, and, if so, how is it to be formulated. Eleven different sorts of criteria of the term "mental" in current discussion are briefly stated, and a full bibliography is appended.

Pillsbury, in his new book (10), retains the term consciousness, using it in the sense of the whole grouping of mental states at one time. He also points out that attempts to state its conditions have failed. "The most that can be said is that of the different systems that are found within the nervous system at any one time, the largest and most active is accompanied by consciousness" (p. 553). As for the subconscious, it is evident that most neural activity is not accompanied by consciousness, but in view of the fact that we know so little of the conditions of consciousness, speculation as to whether such phenomena have a psychic side is of doubtful value. McDougall (9), who uses the word apparently in the sense indicated above, defines the subject-matter of psychology in terms of its extent; every fact that the psychologist touches must "either be itself a fact of consciousness or be restatable as a condition or product of consciousness." But conscious phenomena get their form and their value from an underlying and unitary self.

Dunlap (3) insists on a distinction between consciousness and its content. Consciousness is the awareness of a content, either present or non-present (objectively). In this sense, consciousness is not observable; it is impossible to find true instances of the "awareness of an awareness." The content, to be sure, is observable, but not as the series of psychic objects which are usually assumed to be visible through introspection. What is really observed is a series of bodily changes. This is defended in the case of feeling and of image, which are reduced to "muscle-contractions." By the subconscious is meant simply the fact that muscle-contractions appropriate to a situation may exist without becoming content of consciousness. There is needed a term for the totality of conscious content; the word "mind" should be used with this meaning, and is admitted to "the place of honor as the chief subject of the psychologist's study." McComas (8) publishes an interesting critique of motor theories of consciousness. Such theories he considers extravagant, when they assume that all consciousness is conditioned or accompanied by motor activity. The theories of Dewey, Münsterberg, Judd, and Watson are briefly stated. The author's criticism points out that such theories assume as a general principle what is true only of special cases. Motor areas are not so important for the integrity of mental life as such theories would assume, nor is it conceivable that each quality of sensation finds representation in a characteristic motor response. The method of expression has not been able to demonstrate unambiguous results

in the realm of feeling, nor are speech-movements always obtainable with silent reading or recitation. The belief that the motor process is also the central and the sensory process is a distortion of a valuable truth. Hollingworth (4) denies the existence of a gulf between physical and mental. Experiences are classified under one or the other rubric according to their statistical frequency; all are really psychophysical. The experiences which occur least commonly constitute the subject-matter of psychology, which is thus "the science of statistically variable experience." There is no need to assume a consciousness conditioned by other criteria.

Kempf (5) raises the question whether the monkey may not exhibit self-consciousness. He finds one rhesus monkey which seemed to try to disguise his motives from his fellows, and, on this ground, is inclined to answer the question in the affirmative. He goes on to ask whether such consciousness of self may not add a constant variable that makes it impossible accurately to predict the responses of such organisms. Smith (12) is also interested in the question of consciousness in the animal series, but not to the exclusion of behavior data. A review of the book does not fall within the scope of this article.

Watson touches on the question of the subconscious in his attempt to work out a behavioristic terminology for mental disease (14). It is of course a matter of habit systems, and its disturbances are matters of "habit twists." The difference between conscious and subconscious habit systems lies in the fact that the subject cannot phrase in words those which are subconscious. Prince (11) restates his thesis that the meaning of ideas is to be found in their subconscious settings, sometimes partly in the twilight zone of consciousness. This principle, with a view of instinct, emotion and sentiment derived from McDougall and Shand, is applied to the conception of the psycho-neuroses. Dooley finds that by the word-association method it is easy to uncover conscious and subconscious complexes in normal individuals (2). Reactions which are most self-conscious tend to occur most slowly. The association of ideas is frequently determined by subconscious factors, often in a very intricate fashion. The existence of complexes unknown to the subject may be demonstrated, but it is not true that, as Freud holds, these are invariably of a sexual nature. Dearborn (1) insists on the importance of a knowledge of cenesthesia, including kinesthesia. This constant stream of sensations, resulting from the constant motion of every organ and tissue, is integrated by some such agency

as Kant called "the transcendental unity of the understanding," and gives rise to the subconscious, the dynamic part of mind. "To ignore the subconscious as an element of mind in one's thought . . . is as unsanctioned as for a physician to refuse the fact of the infectious origin of some diseases."

It seems a pity that a part of the immense labor which Jung must have undergone in writing his *Psychology of the Unconscious* (6) could not have been expended in learning something of modern psychology, of which he shows an amazing ignorance. There is in his work so much that is vital and suggestive that a reinterpretation in more scientific terms would be a real service. Essentially, the driving force of human conduct is conceived as the "libido," a stream of vital energy which is not altogether sexual, as Freud says, but which comes to flow through all sorts of channels, including the sexual. The libido, to change the figure, attaches itself to various sorts of objects, which then become of value and worth to the individual. At first, in child and race, these objects are few in number and are those which have to do with the immediate needs of the individual and with those persons with whom his relationships are closest. Gradually, after a struggle with the old, the range of objects is widened, and the individual gains a harmonious balance of interests and tendencies. Most of this is, of course, just old fact in a new dress; the bulk of the book is taken up by a statement and attempted interpretation of the symbols by which individual and race have depicted to themselves the various phases of the process. The inner meaning of such symbols is usually unknown to those who create them, they must be analyzed to be understood.

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## INTROSPECTION AND GENERAL METHODS

BY C. H. TOLL

*Amherst College*

Developing the program of a psychology in which introspection has no part, Lashley (7) reviews the work done on the conditioned salivary reflex in man, urging the importance of this method for study of the mechanism of learning; and Watson (19) reports work with conditioned motor reflexes in man, concluding that the method is widely applicable, *e. g.*, in pathology as well as in studies of memory, association reactions, and problems of sensory experience.

Brown (3) considers that the conscious entities of the introspectionists are "really nothing but integrations of physical states and organic processes"; and Abbot (1) argues that psychology can be objective only by understanding that mind is related to brain as respiration is to lungs, and that all reactions are adaptive to the complete environment. Hollingworth (6) finds that introspective psychology has failed to discover qualitative differences between the several kinds of experience which are supposed to have different degrees of objectivity, and that the true distinction between the psychical and the physical is simply the statistical difference between the "indefinite and rare" and the "definite and common"; "in this sense, and in this sense alone, psychology may properly be defined as the science of behavior—it is the science of the behavior of statistically variable experience." According to Givler (5) behaviorism is "a theory of the criteria of mind and not a system that can be substituted for psychology," but he also writes that "minds are what human bodies do with nature." Psychology



should reject the concept of causation, and should aim at descriptive laws of functional dependence.

The series of Bonaventura's (2) articles concludes that reports of subjective certainty depend upon a reconstructive activity, which tends to false report, and an opposing activity which he calls introspection. Strictly speaking introspection is always retrospection: it can never be wholly accurate, few people possess the power to any considerable degree, and even experimental use of it cannot be expected to give valuable results. The material available for psychology is the product of a psychic activity, but never the activity itself: these phenomena may be studied objectively; and from them may be inferred "the qualities and forms of the psychic processes which have determined them." MacDougal (9) also holds that psychology deals only with phenomena, taking the events in the mental life from the standpoint which conceives them in terms of content and relation, not in terms of forms and significance. Psychology must postulate the existence of the self as an intuited, noumenal reality, but can deal with it only as phenomenal: "the self is the summum genus of the psychologist, the theoretical concept which expresses the necessity he finds for a common reference in all the phenomena he considers."

In his elementary text-book Titchener (16) abandons the term consciousness, and would be willing to let introspection go, but retains it temporarily as the name for observation—the method of all science—when made with the distinctive psychological attitude, *i. e.*, viewing the world "as it is in man's experience," "the world with man left in." The general problem of psychology is "to analyze mental phenomena into their elements, to discover the laws of mental connection, and to work out in detail . . . the correlation of mind with the nervous system." In Pillsbury's (10) text psychology is said to have two methods, observation (by others) and introspection ("self-observation"). The explanation of mental states should be in terms of antecedent mental states as far as possible; but in some problems it is necessary to admit that "mind and body undoubtedly interact."

Turro (17) argues for the necessity of introspection, but considers that by itself it gives material only for a descriptive science; psychology should be a causally explanatory science, however, as neural processes are demonstrably "indispensible conditions" of the psychical processes. The term introspections is used by Forel (4) for what he calls the primary psychical syntheses, whose

"energy-elements" cannot be discovered by any analysis of these experiences: secondary syntheses, comparisons of introspections, form the body of all science. Wallis (18) thinks introspection is without value when it is individual or "within," but that it can be made social or "without"; and Ossip-Lourié (8) argues that the method of psychology is "neither purely subjective nor exclusively objective."

Investigating the actual use of the method of introspection Ruckmich (11) finds "there are roughly two and a half times as many introspective as non-introspective experimental papers" in the American periodicals for general psychology from 1905 to 1915, and that "introspection has contributed more generously to normal, human, adult psychology during the past decade than has any other method."

The historical method in psychology is discussed by DeSarlo (12), who urges it has not received adequate attention: it should be applied to all the forms of psychic life. As used in psychology it must assume the developing process has a teleological character; but the directive ends are often not conscious, and so not apparent to immediate observation: the historical method is required to determine their character.

Concerning definitions, Smith (13) argues that in any science some apparent judgments of fact are really only concealed definitions, and as such are dependent on choice; and that within any given science the choice cannot be properly made until one can "forsee the effect this choice will have upon its cognate disciplines."

Methods of computation, of some general applicability, are described by Thorndike (15) for determining the probable relative order of a set of terms when each of the available judgments of order deals with only a part of the set, and by Spillman (14) for calculating the probable size of some hereditary groups when certain incomplete data are the only ones available.

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## BIBLIOGRAPHICAL

BY HOWARD C. WARREN

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Hilger's (3) summary of the literature of psychotherapy in 1912-13, although limited in scope, is valuable on account of its full resumé. A most complete contribution to the bibliography of child study is that of Waddle and Root (6), with 845 titles under 22 headings. The bibliographies seem well chosen and valuable. Several of the bibliographies included in Burnham's pamphlet (2) deal with the psychology of childhood; we should also mention the earlier work in the same series, containing bibliographies on Educational Psychology (No. 3, published 1913).

Among the bibliographies of individual authors should be mentioned the list of Royce's writings (4) in the Royce number of the *Philosophical Review*. While a majority of the references lie in the

field of philosophy, Professor Royce's contributions to psychology should not be overlooked. In addition to his *Outlines*, we find 18 articles dealing with a wide variety of psychological problems, ranging all the way from mental pathology and psychical research to imitation and invention. The examination of John Bunyan's mentality in the first issue of the *Psychological Review* furnishes an excellent example of the author's incisive analysis.

Most of the bibliographies on special topics are found in the works listed in the special reviews devoted to these topics. Ruckmich (5) gives a supplementary bibliography on Rhythm with 66 titles. The original list appeared in the *American Journal* for 1913.

In connection with the editorial change in the *Psychological Index* it is perhaps worth while at this time to mention the bibliographies contained in this annual (1), which supplement the lists appended to our general reviews. The annual general bibliography appearing in the *Zeitschrift für Psychologie* has lately been substantially the same as the *Index*, but prior to 1900 the lists differ considerably and both should be consulted.

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## APPARATUS

BY C. E. SEASHORE

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Aside from the instruments which have been described in the *Psychological Review* series of publications and those described in connection with various investigations in which they have been used, the following deserve mention:

The instrument described by Garten (1) works on the principle that the vibrations of the very small soap membrane are photographed through a microscope focused on a very minute fragment of iron suspended magnetically. This method makes it possible to register very high tones, *e. g.*, the highest of the Galton whistle. The article contains a good review of related methods of registration.

Strein (3), working in the phonetic laboratory of Hamburg, has submitted the various means of securing a graphic record of the voice to critical examination, and has published a 270-page report on the technique of the apparatus involved, particularly the clock works.

Wethlo (5) describes a new turbo-stroboscope which consists of Flatau's laryngoscope mounted with and driven by an air pressure turbine. The turbine is no larger than a walnut and is capable of making about 250 revolutions per second, thus making it possible to see high frequencies of vibration with a convenient instrument.

Patten (2) describes an instrument for projecting a small spot of light suitable for exploring photo-sensitive areas. It consists of a microscope with a small tungsten bulb in place of the ocular. The rays projected through the objective furnish the required stimulus under accurate and convenient control.

The myosthenometer described by Tilney (4) is essentially a dynamometer in which a plunger operates against a calibrated spring and registers in kilograms. The instrument is of such form that it may be used as a reflection liminometer on hand or foot.

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## TEXTBOOKS AND GENERAL TREATISES

BY HERBERT SIDNEY LANGFELD

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Titchener's (7) *Beginner's Psychology*<sup>1</sup> appeared too late to be included in last year's summary, but owing to its importance for the teacher of psychology brief mention should be made of it, even at this late date. It supplants the old Primer which will not be revised.

Pillsbury's (5) new textbook is in style similar to his *Essentials of Psychology*, but it contains much more material. The number of chapters is the same, and the titles have been but slightly altered, but the present book is almost twice the size of the former. As the author states, the book is half way between a small textbook and an elaborate reference handbook. It is very inclusive, containing a great many subheadings, each of which is treated briefly and clearly so that the book may very well be used by the beginner as a reference book. The author has aimed to make the book as objective and impersonal as possible. It is much more a collection of facts than a systematic unified treatise. The author does not even allow his behavioristic bias to prevent him from treating sensation and perception in structural terms. Long discussions and criticisms are avoided, and theories open to serious controversy are omitted. On the other hand much space is given to a description of important experimental findings. A large section of the book is devoted to the anatomy, physiology and psychology of sensation. Under perception space perception is the most fully treated. Under memory is included a large section upon recognition. The treatment of reason is half psychological, half logical. The last part of the book covers the instincts, emotions, will and the self.

Von Aster (1) has written an introduction to psychology for the popular series *Aus Natur und Geisteswelt*. He has touched upon the main problems of psychology in a conventional manner. The style is serious, often very technical and it is a question how far the untrained reader will be able to understand him. The author is strongly influenced by Lipps and by the Würzburg School. There is considerable arm chair non-experimental reflection with frequent excursions into the realms of values and epistemology. The book is intended for the German public, each chapter beginning

<sup>1</sup> A special review has appeared in the BULLETIN for November, 1916.

with references to a few German texts. Physiological and experimental facts as well as an occasional more extensive theoretical discussion appear in small print.

Poffenberger (6) is the author of a collection of loose sheets describing forty-eight experiments for use in the psychological laboratory. Each sheet deals with a separate experiment, the arrangement being similar to that followed by those laboratories which use loose mimeographed sheets for their instructions to the students. At the top is a reference to one or more texts dealing with the particular problem. Then follows a statement of the problem and the materials to be used. The procedure and method of recording the results are described for the most part in detail, and finally the nature of the conclusions are suggested by a series of questions calling the student's attention to the various facts of the experiment. Most of the exercises are based upon well-known experiments, a goodly number of which have appeared from the Columbia Laboratory. Where, from the nature of the experiment, it is inadvisable for the subject to have a knowledge of the procedure or the nature of the results only the references and statement of the problem are given. Special attention is devoted to an encouragement of introspective analysis on the part of the student. Most of the experiments deal with the higher processes of perception. There are several experiments upon the psychophysical methods for obtaining the various thresholds. A number of the sheets deal with problems of memory, among which might be mentioned the interesting ones upon "Retroactive Inhibition," "Curve of Forgetting," "Memory for Names and Faces," and "Incidental Memory." Habit and practice, the nature and various forms of association and the functioning of images are covered by a series of tests. Muscular fatigue is studied by means of the ergograph and tapping-board and visual space perception by the stereoscope and pseudoscope. Practice in the use of the tachistoscope is afforded by experiments on the span of perception, the perception of number and form, etc. Finally there are a number of experiments covering problems in aesthetics. The value of this loose leaf manual is increased by the privilege of buying separate experiments if ordered in quantities.

Langfeld and Allport's (2) experimental manual is intended for use in introductory training courses. Instead of aiming at completeness the authors have selected a sufficient number of experiments for a half course, which can be easily performed by the be-

ginner, which can be carried out by a large class in the same room, which will impart a knowledge of the principal methods and important facts of psychology, which require no expensive instruments and which give clean cut results. There is a detailed description of method for each experiment as well as complete instructions for the recording of results. Descriptions and illustrations for making the simple instruments together with cuts explaining the manner of tabulating the data have been introduced wherever necessary. Throughout the aim has been to make the student as independent of the instructor as possible. There are seventy-eight experiments, some original and the others modifications of well-known experiments selected as evenly as possible from the various fields of psychology. About a third of the book is devoted to the sensations. The various forms of space perceptions are illustrated and several experiments are devoted to the perception of time. The span of perception, and the perception of words and meaning including the determining tendency are also included. There are chapters upon attention and the association of ideas, including the practical problem of the detection of suppressed ideas. Under memory the students are given the opportunity of analyzing the learning curve. Imagery is also studied and the last section is devoted to the various methods of experimenting upon the affective processes with special reference to æsthetics. At the end of each experiment there are a number of questions dealing with the method and facts of the exercise and the wider theoretical and practical significance of the results.

Washburn's (9) book upon movement and imagery considers in so thorough a manner so many fundamental facts of psychology that a description of its contents seems in order in this place. The subtitle "Outlines of a Motor Theory of the Complex Mental Processes" indicates the purpose and wide scope of the treatise. The opening chapter deals with the combinations of movements into systems and "sets." There are two kinds of systems, successive and simultaneous. The first has its order determined and irreversible, the second indeterminate and reversible. This latter may be resolved into irreversible successive movements. All consciousness is accompanied by movement and the question arises whether this movement is unhampered or inhibited. This leads to a critical discussion of Münsterberg's Action Theory which, by asserting that vivid consciousness is conditioned by free motor discharge, comes in conflict with the introspectively discoverable

features of habit formation. In order to reconcile this theory with the facts the author alters the theory in the direction of the simultaneous excitation and inhibition of motor impulses: "consciousness accompanies a certain ratio of excitation to inhibition in a motor discharge and . . . if the amount of excitation either sinks below a certain minimum or rises above a certain maximum, consciousness is lessened." The application of this theory is fully illustrated in the next chapter, where the five degrees of motor responses and the accompanying consciousness are described. The kinæsthetic excitations are an essential link between movements, the kinæsthetic impulse of movement *A* initiating the following movement *B*. This kinæsthesia, frequently the result of very slight movements, called by the author tentative moments, is not always discoverable by introspection, but it is nevertheless present and of great functional value. There then follow several chapters upon the various phenomena of association and memory, with interesting interpretations in motor terms. "The Problem of Purpose" considers the "Aufgabe" and the determining tendency. The motor explanation of purpose or determining idea is in terms of persistent tentative movements. In the discussion of the reasoning process there is an interesting explanation of logical fallacies in motor terms. In so-called imageless processes there is kinæsthesia and that introspection does not always find it is no argument against its existence. It is then shown how the various attitudes familiar to students of "imageless literature," such as feelings of relation, of familiarity, etc., may be readily analyzed. In the last chapter the various factors causing disassociation are described. It has been impossible in this short space to do more than suggest a few of the many points considered. The book is probably the most thorough attempt to apply a motor theory consistently to the various higher mental processes.

In the same series as von Aster's book appears a little book by George Sommer (8) in which he has incorporated a course of lectures upon intellectual endowment and inheritance. The author's interests are both psychological and practical. The problem of eugenics is prominent. The first part of the book is devoted to a description of the central nervous system. Much attention is devoted to the various theories of inheritance. The nature and importance of instincts is also discussed and the responsibility of parents in regard to the mental attainments of their offsprings is explained. There is an analysis of talent and genius and the intellectual and emotional characteristics of several historical char-

acters are described with the aim of tracing the origin of these peculiarities. There is considerable space devoted to the discussion of the possibility of the inheritance of acquired characteristics. Although not dogmatic the author seems inclined to accept this theory. There is little new in the book, which is semi-popular and evidently intended for those who have little knowledge of this important subject.

Münsterberg (3) has written a semi-popular book upon the moving pictures, which is divided into three parts. The first deals with the history and development, the second with the psychology and the third with the æsthetics of the photoplay. He believes that it is a new art, distinct from the drama and his main theme is the analysis both psychological and æsthetic of its characteristic features. In the chapter upon "Depth and Movement" stereoscopic vision is explained, but special interest is directed to the perception of movement with emphasis upon the fact that movement is not merely a perception of successive points in space. The experiments of Wertheimer and Korte are described to show that an explanation of movement must include central factors. In the chapter upon "Attention" the factors effecting attention in life, in the drama and in the photoplay are given. Not only, however, can the photoplay cut back, it can also cut off and by subtle suggestions encourage the play of the imagination. The most important feature of the photoplay is the arousal of the emotions and it is to this subject that the last chapter of the psychological part of the book is devoted. In place of the spoken word the actor must substitute heightened emotional expressions of face and gesture. Also the technique of the camera offers numerous ways of arousing emotions in the audience.

Patrick (14) shows in a collection of essays, four of which have already appeared in magazine form, that the desire for relaxation from the strenuous intellectual life is the final explanation of play, laughter, profanity, the use of alcohol, and war. The treatment is psychological, psychogenetic and sociological. The three important theories of play (Schiller-Spencer, Gross, and Recapitulation) are reviewed and found wanting. The essential explanation is not the desire for a safety valve for excess energy or a preparation for the battles of life, but a relief from the strain of the present strife by a return to the primitive instincts and activities. The necessary daily struggle requires a continual exercise of comparatively new functions. Relief is found in activities along the well-worn paths.



It is the nature of the child to play. The sports of the adult are similar to those of the child and it is shown how they also have their origin in primitive activities. Laughter is also a relaxation from the serious pursuits, but a supplementary principle must be added, that of exultation. Profanity, which is now a means of relief, has also its origin in this ancient struggle. For the most part the profane words were used to terrify the enemy. After showing that alcohol has no beneficial effect upon the organism and therefore cannot be desired for that purpose, the author asserts that the craving for the drug is due to the fact that it benumbs the higher intellectual functions and enhances the activities of the lower and older activities. Man is not by nature peace loving. Periodically he must revert to the old instincts of primitive strife and wars will continue unless a permanent and less harmful means for the exercise of his original nature can be found.

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## SPECIAL REVIEW

*Psychology of Relaxation*. G. T. W. PATRICK. Boston: Houghton Mifflin Co., 1916. Pp. vii + 280.

Under this title Professor Patrick has brought together a series of studies on the psychology of play, laughter, profanity, alcohol and war. Four of these have appeared in various periodicals in a somewhat different form. The essay on laughter, the introduction,

which points out the need and timeliness of a consideration of these topics in existing social conditions, and the conclusion, which deals with suggestions of reform, are new. The idea which links the topics together is the idea of *catharsis*, interpreted in a sense derived from modern conceptions of genetic psychology. It is assumed, namely, that the progress of civilization is connected with the development of functions requiring a high degree of effort and attention, incapable of being long sustained without fatigue and tending, therefore, constantly to give place to those more stably organized and more easily exercised, in other words, to the more primitive which, in the interests of progress, have been repressed. The "relaxation" affords relief, redresses the balance of the vital energies, purifies and purges by breaking down the obstructing barriers. The typical cases are play and sport. Children's plays take on characteristically a reversionary form and are not, as Groos held, anticipatory rehearsals of activities that belong to later life: the boy runs, wrestles, swims, climbs trees, shoots with bow and arrow, goes fishing, canoeing, camping, etc. The brain-paths involved are the time-worn, easy paths requiring no new associations, no strong and sustained effort of attention and will. The same thing is true of sport. Profanity is a primitive and instinctive form of reaction to a situation analogous to that of actual combat; its primary purpose is to shock. It is one of the various forms of primitive vocalization analogous to the growl or roar of anger in animals. Its cathartic effect is found in the allaying of emotion, not, however, as a mere vent or drainage-channel, but as a substituted form of useful reaction. The desire for alcohol, which in spite of all the efforts to combat it seems steadily to increase, is due to the tension connected with progress, from which it affords an artificial relief by narcotizing the higher centers and thus liberating the older, freer life of the emotions and primitive impulses. War is a form of "the rebellion of society as a mass against the too insistent urge of progressive forces"; it is "a temporary reversion to completely primitive instincts restoring the balance to an overwrought social brain." Such are the main theses developed in this interesting and readable volume. And the moral is that as relaxation is necessary and desirable, those forms of it which, like play, sport and laughter, are natural and healthful, should be cultivated as against those which, like profanity, alcohol and war, are unseemly, deleterious or destructive.

With this moral every sane and sensible man will be in hearty

sympathy. And the psychologist will readily acknowledge that a flood of light is thrown upon all the phenomena here under investigation by the principles of genetic psychology which the author invokes. Nevertheless it may be questioned whether his application of them is not too general and abstract, whether in their complexity and in the complexity of modern conditions they can be adequately accounted for simply as reactions against the tension of progress and the repression of the primitive. To begin with, the term "relaxation" as meaning release from tension seems of doubtful applicability to the play of children, and even as applied to sport the principle of catharsis seems a little overworked. The present cult of sport and the headlong pursuit of amusement of every description are explained as a reaction from the excessive demands, the excessive tensions of modern life. And this is probably in large measure true. But is it the whole truth? Would it be true of similar phenomena in the decadent Roman Empire? What of the amusements of the idle rich, or of the idle who are not rich? What of sport as a business, a profession? And what of the power and social influence of imitation? In the case of alcohol some doubt is thrown upon the author's contention by the uncertainty and incompleteness of the evidence. The recent investigations of Dodge in the nutrition laboratory of the Carnegie Institution point to the paralyzing effect of small doses of alcohol not on the higher, but on the lower centers, or at least more on the latter. Meanwhile it is certain that men drink from a variety of impulses. But perhaps the greatest objection will be raised to the author's treatment of war. It is, of course, familiar doctrine that war is reversionary, a "relapse into barbarism," a setting free of the old fighting instincts; we also speak of the "war game," suggesting, superficially, the application to it of the principles that govern sport. But to treat it fundamentally as a sport, as fundamentally a natural and practically inevitable demand for release from the high tension of living, in a word, as a sort of grim social holiday, seems not a little inept. It is to be explained, certainly, from the nature of man, but little is gained by regarding it vaguely as a "survival of ancient predatory instincts," and the nature of man finds expression in dynastic ambitions, stiff-necked diplomatic stupidity, communal fears and tribal loyalties, as in the impulse to find relief from the pressure of progress. And surely modern warfare involves for the peoples engaged in it a tension and concentration not less, but, if anything, greater than in times of peace;

there is change in the direction of activity, hardly a diminution in its quality and amount. It is difficult, therefore, to take as serious the view which regards it as "restoring the balance to an overwrought social brain."

In the case of laughter the author himself feels obliged to go beyond the principle of relaxation. This is because in the first instance, following Miss Bliss, he regards laughter as a form of reaction against the repressive forces of society; it is the spontaneous outburst of joy, he says, whenever the old and natural suddenly appears amidst the restrained and artificial. But as this does not seem to account for the laughter of triumph and contempt, appeal is made to the supplementary principle of exultation. Here, however, the appeal seems a little unfortunate. For, if we distinguish laughter from the occasions which give rise to it and the emotions aroused by the situation, the phenomenon is wholly one of relaxation, as is pointed out in the passage quoted from Angell on p. 123. The problem then is to explain why we laugh in some situations and not in others. The mistake arises from the initial identification of laughter with the ludicrous. But one is quite capable of finely enjoying a comic situation without explosive cacchination. And if laughter is the phenomenon of social relaxation described, is it not a little strange that, with the increasing repression of primitive instincts incident to an advancing civilization, the author should have to lament its decline in forms hearty and whole-souled, whereas in the case of amusements and sport the reactions against the tensions of progress appear as extravagant as the demands?

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## DISCUSSIONS

### EFFECTS OF SMOKING ON ADDING

At the time the writer began this experiment he intended to make an extensive experimental investigation of the effects of smoking on mental work, but on account of other interests he has been compelled to give up his original plan. He presents here the results of his introductory experiment with the hope that others may be led to make experimental studies in this field.

The writer did not begin to smoke until some years after he was out of college. Prior to the time of this experiment he had been smoking for about two years but very irregularly. Rarely

did he smoke more than one cigar a day and frequently he would go for days without smoking at all. He never attempted to work while smoking, but when he turned to mental work after having smoked a cigar he thought he studied less effectively. Smoking seemed to lessen his power to concentrate.

The writer decided to test this hypothesis by determining whether he could add a given number of figures as rapidly and accurately immediately after smoking as when he did not smoke. He arranged a series of typewritten examples in addition. Each example contained one hundred figures arranged in ten columns of ten figures each. The same figure appeared twice in succession in no column and no zeros were used in any of the examples. The daily test consisted in working fifteen of these examples in addition as rapidly and accurately as possible. The test was begun at approximately the same time each day—about thirty minutes after dinner in the evening. On the days the writer smoked he smoked but one cigar and that one immediately after dinner. After smoking the cigar, which usually took about thirty minutes, he at once began the addition test. On the days he did not smoke the thirty minutes after dinner were spent in conversation or light reading. The experiment was carried on for a period of twenty days, the writer smoking only on alternate days.

The results of the experiment are given in the accompanying table:

| Serial Days      | Errors  |            | Time in Minutes and Seconds |            | Differences,<br>Sec. |
|------------------|---------|------------|-----------------------------|------------|----------------------|
|                  | Smoking | No Smoking | Smoking                     | No Smoking |                      |
| 1                | —       | 22         | —                           | 23: 50     |                      |
| 2                | 12      | —          | 21: 30                      | —          | 7                    |
| 3                | —       | 11         | —                           | 21: 37     |                      |
| 4                | 10      | —          | 19: 38                      | —          | 17                   |
| 5                | —       | 8          | —                           | 19: 55     |                      |
| 6                | 18      | —          | 18: 45                      | —          | 30                   |
| 7                | —       | 21         | —                           | 19: 15     |                      |
| 8                | 15      | —          | 18: 10                      | —          | 67                   |
| 9                | —       | 9          | —                           | 19: 17     |                      |
| 10               | 5       | —          | 18: 3                       | —          | 34                   |
| 11               | —       | 7          | —                           | 18: 37     |                      |
| 12               | 10      | —          | 17: 23                      | —          | 67                   |
| 13               | —       | 8          | —                           | 18: 30     |                      |
| 14               | 8       | —          | 16: 23                      | —          | 70                   |
| 15               | —       | 7          | —                           | 17: 33     |                      |
| 16               | 14      | —          | 15: 50                      | —          | 76                   |
| 17               | —       | 11         | —                           | 17: 6      |                      |
| 18               | 6       | —          | 16: 27                      | —          | 73                   |
| 19               | —       | 9          | —                           | 17: 40     |                      |
| 20               | 10      | —          | 16: 11                      | —          |                      |
| Averages . . . . | 10.8    | 11.3       | 17: 50                      | 19: 20     |                      |

Effect of  
Physiological  
Stimulation



In the first column is given the number of days; in the second the number of errors made in the test after smoking; in the third the number of errors after no smoking; in the fourth the time in minutes and seconds required to perform the test after smoking; in the fifth the time required after no smoking; and in the last column the differences in time required to perform the test between the second and third days, the fourth and fifth, etc.

The results of this experiment show that smoking instead of increasing the time required to perform the test had just the opposite effect, contrary to the writer's expectation, for on the average the tests were performed in seven and seven-tenths per cent. less time on the days the writer smoked than on the days he did not smoke. From day to day the effects of smoking were more marked than the effects of practice; for in every case the time required to perform the test after smoking was less than the time required for the test on the following day after no smoking. These differences are indicated in the last column of the table. As we should expect, the differences increase as the improvement in adding decreases.

From consulting the table it is seen that the average number of errors made in performing the tests after smoking was slightly less than those made after no smoking. However, the difference is so slight as to be almost negligible.

The striking thing about the results of this experiment is that they are in such marked contrast to those obtained by other experimenters. Lombard<sup>1</sup> and Harley<sup>2</sup> found that smoking tends to reduce the power of voluntary muscular contraction, while Bush<sup>3</sup> in a recent investigation on the effect of smoking on mental efficiency sums up his results with the following statement: "A series of one hundred twenty tests on each of fifteen men, in several different psychic fields, show that tobacco smoking produces a ten and five-tenths per cent. decrease in mental efficiency." He found further: "The man who had the highest percentage decrease of efficiency was the one who used tobacco the least; likewise, the man who smoked fifteen or twenty cigarettes daily had less decrease than the man who smoked but two or three. On the other hand, the man who smoked about one cigar a month had far less reaction

<sup>1</sup> LOMBARD, W. P., Some of the Influences which Affect the Power of Voluntary Muscular Contractions. *J. of Physiol.*, 13, 44.

<sup>2</sup> HARLEY, V., The Value of Sugar and the Effect of Smoking on Muscular Work. *J. of Physiol.*, 16, 118.

<sup>3</sup> BUSH, A. D., Tobacco Smoking and Mental Efficiency. *N. Y. Med. J.*, 99, 519-527.

than the one who smokes three to ten pipefuls daily." Unfortunately Bush in this interesting article has failed to give the original data from which his table of percentages has been computed. Furthermore, the description of his method of conducting the tests is not sufficiently detailed to determine whether the marked difference in his results as compared with those of the writer is due to different methods of conducting the experiments or to other factors.

It is quite possible that if the writer had conducted his test at a different time of the day the results would have been different. If the test had required a longer period of time for its performance the results might have been different; for the period of stimulation may be followed by a period of depression. But it is perfectly evident that enough work has not yet been done to justify generalization. The whole subject remains a fruitful field for investigation.

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#### A METHOD OF CALCULATING THE PEARSON CORRELATION COEFFICIENT WITHOUT THE USE OF DEVIATIONS

To compute correlation coefficients is rather tedious, not so much because of any complexity in any of the operations but because of the numerous opportunities to make arithmetical errors in counting steps from the mean in all possible directions of the data sheet and in the confusion of innumerable plus and minus signs. The following procedure enables one to calculate the Pearson correlation coefficient without computing the deviations and makes it possible to disregard entirely the confusing plus and minus signs which are so vital in the usual correlation computations. The coefficient is expressed as a function of the original numbers to be correlated.

The coefficient is usually expressed in the following form:

$$r = \frac{\Sigma(x \cdot y)}{n \cdot \sigma_x \cdot \sigma_y} \quad (1)$$

This may be rewritten in the form:

$$r = \frac{\Sigma(x \cdot y)}{\sqrt{\Sigma x^2} \cdot \sqrt{\Sigma y^2}} \quad (2)$$

in which  $x$  and  $y$  represent the deviations from the mean.

The present problem is to derive a restatement of the coefficient in terms of  $A$  and  $B$ , the two original numbers to be correlated. We will first derive a formula for  $\sqrt{\Sigma x^2}$  in terms of  $A$  which will, by analogy, enable one to write the corresponding formula for  $\sqrt{\Sigma y^2}$  in terms of  $B$ . Then a formula will be derived for  $\Sigma(xy)$  in terms of  $A$  and  $B$ . The three formulæ may then be combined into a formula for  $r$  in terms of  $A$  and  $B$ .

*Derivation of  $\sqrt{\Sigma(x^2)}$  in Terms of  $A$  and  $n$ .—Let*

$$x = A - m_a, \quad (3)$$

in which  $A$  is an actual score,  $m_a$  is the mean of all the scores and  $x$  is the deviation of the score  $A$  from the mean  $m_a$ . Then

$$x^2 = A^2 - 2Am_a + m_a^2.$$

Taking the summation of  $x^2$ , we have:

$$\Sigma(x^2) = \Sigma(A^2) - 2m_a\Sigma(A) + nm_a^2.$$

But  $m_a = \Sigma(A)/n$ .

Hence

$$\begin{aligned} \Sigma(x^2) &= \Sigma(A^2) - 2 \frac{\Sigma(A)^2}{n} + \frac{\Sigma(A)^2}{n} \\ &= \Sigma(A^2) - 2 \cdot n \cdot m_a^2 + n \cdot m_a^2, \\ \Sigma(x^2) &= \Sigma(A^2) - n \cdot m_a^2. \end{aligned} \quad (4)$$

By analogy we have, for the other attribute  $B$ ,

$$\Sigma(y^2) = \Sigma(B^2) - n \cdot m_b^2. \quad (5)$$

*Derivation of  $\Sigma(x \cdot y)$  in Terms of  $A$ ,  $B$  and  $n$ .—Let, as before,*

$$x = A - m_a, \quad (3)$$

$$y = B - m_b, \quad (6)$$

in which  $A$  and  $B$  are the two original numbers,  $m_a$  and  $m_b$  the arithmetic means of the  $A$ 's and  $B$ 's respectively,  $x$  and  $y$  are the deviations of  $A$  and  $B$  from their corresponding means.<sup>1</sup> Then

$$\begin{aligned} xy &= (A - m_a)(B - m_b) \\ &= AB + m_a m_b - m_a B - m_b A. \end{aligned}$$

<sup>1</sup> Since submitting the manuscript for this article I have discovered that Beardsley Ruml has derived independently a formula for the standard deviation without using the individual deviations. Ruml's discussion is identical with that part of the present article which concerns the denominator of the correlation formula. It is contained in the BULLETIN for Nov. 15, 1916.

Hence by summation,

$$\Sigma(xy) = \Sigma(A \cdot B) + n \cdot m_a \cdot m_b - m_a \Sigma(B) - m_b \Sigma(A).$$

But

$$m_a = \frac{\Sigma(A)}{n}, \quad \text{and} \quad m_b = \frac{\Sigma(B)}{n}.$$

Hence, by substitution,

$$\begin{aligned} \Sigma(xy) &= \Sigma(A \cdot B) + \frac{\Sigma(A)\Sigma(B)}{n} - \frac{\Sigma(A)\Sigma(B)}{n} - \frac{\Sigma(A)\Sigma(B)}{n}, \\ \Sigma(xy) &= \Sigma(AB) - n \cdot m_a \cdot m_b. \end{aligned} \quad (7)$$

The coefficient is, as before,

$$r = \frac{\Sigma(x \cdot y)}{\sqrt{\Sigma x^2} \sqrt{\Sigma y^2}}. \quad (2)$$

Substituting from equations 4, 5 and 7, we have:

$$r = \frac{\Sigma(A \cdot B) - n \cdot m_a \cdot m_b}{\sqrt{\Sigma(A^2) - n \cdot m_a^2} \sqrt{\Sigma(B^2) - n \cdot m_b^2}} \quad (8)$$

This formula looks more cumbersome than the more usual form, but it is less time consuming in practice, and certainly less taxing on one's attention to numerical detail.

The following is a sample calculation showing a convenient arrangement of the data.

*Sample Calculation.*—The first column in the following table numbers each individual, the total number of cases being 50. Columns headed *A* and *B* give the parallel scores to be correlated. The remaining columns give values of  $A^2$ ,  $B^2$ , and  $AB$ .

Substituting the sums of the columns and their means in equation (8) we have:

$$r = \frac{4407. - 50. \times 10. \times 8.}{\sqrt{6042. - 50. \times 100.} \cdot \sqrt{3658. - 50. \times 64.}} = +0.59.$$

The above correlation and several others have been computed by this formula and by the more usual formula. In all cases perfect agreement has been found.

The formula has also been successfully used in cases where the *A* and *B* measures contain both positive and negative numbers.

The particular advantage in using this formula is that correlation work can be carried out by any one who can run an adding

| No. | A   | B   | A <sup>2</sup> | B <sup>2</sup> | AB    |
|-----|-----|-----|----------------|----------------|-------|
| 1   | 4   | 7   | 16             | 49             | 28    |
| 2   | 13  | 9   | 169            | 81             | 117   |
| 3   | 8   | 6   | 64             | 36             | 48    |
| 4   | 3   | 5   | 9              | 25             | 15    |
| 5   | 13  | 6   | 169            | 36             | 78    |
| 6   | 15  | 10  | 225            | 100            | 150   |
| 7   | 12  | 5   | 144            | 25             | 60    |
| 8   | 18  | 8   | 324            | 64             | 144   |
| 9   | 20  | 15  | 400            | 225            | 300   |
| 10  | 12  | 9   | 144            | 81             | 108   |
| 11  | 8   | 7   | 64             | 49             | 56    |
| 12  | 14  | 9   | 196            | 81             | 126   |
| 13  | 17  | 13  | 289            | 169            | 221   |
| 14  | 9   | 11  | 81             | 121            | 99    |
| 15  | 7   | 4   | 49             | 16             | 28    |
| 16  | 2   | 1   | 4              | 1              | 2     |
| 17  | 12  | 7   | 144            | 49             | 84    |
| 18  | 14  | 8   | 196            | 64             | 112   |
| 19  | 9   | 8   | 81             | 64             | 72    |
| 20  | 14  | 11  | 196            | 121            | 154   |
| 21  | 15  | 8   | 225            | 64             | 120   |
| 22  | 19  | 10  | 361            | 100            | 190   |
| 23  | 12  | 12  | 144            | 144            | 144   |
| 24  | 7   | 5   | 49             | 25             | 35    |
| 25  | 1   | 3   | 1              | 9              | 3     |
| 26  | 13  | 8   | 169            | 64             | 104   |
| 27  | 11  | 9   | 121            | 81             | 99    |
| 28  | 16  | 7   | 256            | 49             | 112   |
| 29  | 6   | 3   | 36             | 9              | 18    |
| 30  | 10  | 5   | 100            | 25             | 50    |
| 31  | 4   | 6   | 16             | 36             | 24    |
| 32  | 7   | 6   | 49             | 36             | 42    |
| 33  | 14  | 10  | 196            | 100            | 140   |
| 34  | 12  | 14  | 144            | 196            | 168   |
| 35  | 11  | 8   | 121            | 64             | 88    |
| 36  | 5   | 2   | 25             | 4              | 10    |
| 37  | 2   | 4   | 4              | 16             | 8     |
| 38  | 11  | 11  | 121            | 121            | 121   |
| 39  | 7   | 9   | 49             | 81             | 63    |
| 40  | 5   | 11  | 25             | 121            | 55    |
| 41  | 5   | 8   | 25             | 64             | 40    |
| 42  | 16  | 10  | 256            | 100            | 160   |
| 43  | 10  | 13  | 100            | 169            | 130   |
| 44  | 10  | 8   | 100            | 64             | 80    |
| 45  | 8   | 12  | 64             | 144            | 96    |
| 46  | 6   | 10  | 36             | 100            | 60    |
| 47  | 7   | 7   | 49             | 49             | 49    |
| 48  | 10  | 7   | 100            | 49             | 70    |
| 49  | 10  | 9   | 100            | 81             | 90    |
| 50  | 6   | 6   | 36             | 36             | 36    |
|     | 500 | 400 | 6,042          | 3,658          | 4,407 |

$$m_a = 10, m_b = 8,$$

$$m_a^2 = 100, m_b^2 = 64.$$



machine. The chances of arithmetical error are reduced to a minimum. No arbitrary origin need be selected and consequently the corrections for the arbitrary mean become superfluous.

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## NOTES AND NEWS

WE regret to announce the death of Professor Hugo Münsterberg, of Harvard University, which occurred on December 16; also the death of Dr. Naomi Norsworthy, associate professor of educational psychology at the Teachers College, Columbia University, on December 25.

ANNOUNCEMENTS have also been made of the deaths of Professor Th. Ribot, in Paris on December 8, at the age of seventy-seven years, and of Dr. A. C. Rogers, a pioneer in the work of proper treatment of the feeble-minded and for many years superintendent of the school at Faribault, Minn., in his sixty-first year.

PROFESSOR S. P. HAYES, on leave of absence for the second semester, will study problems connected with the psychology of the blind at the Institution for the Blind at Overbrook, Philadelphia.

DR. WILLIAM HEALY has resigned the directorship of the Juvenile Psychopathic Institute of Chicago to take charge of the Judge Harvey Baker Foundation, a similar institution in Boston.

AT the New York meeting of the American Psychological Association the following officers were elected: President, R. M. Yerkes (Harvard); Secretary-Treasurer, H. S. Langfeld (Harvard); members of the Council, W. V. Bingham (Carnegie) and H. L. Hollingworth (Barnard). The invitation of the University of Michigan to hold the next meeting at Ann Arbor was accepted.

THE American Philosophical Association elected the following officers at its recent meeting in New York: President, A. W. Moore (Chicago); Vice-President, E. G. Spaulding (Princeton); Secretary, W. T. Marvin (Rutgers). The place of the next meeting was left to the Council to select.

SIX lectures will be given by Dr. E. E. Southard, non-resident lecturer at Columbia University, during January and February as follows: Neuropathology and psychopathology; the brains of the feeble-minded; frontal lobe functions; the analysis of delusions; the unconscious; psychopathia.

